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*Title:* ELEVENTH QUARTERLY REPORT - THREE-PHASE  
CENTRIFUGE CONTROL SYSTEM

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## **Eleventh Quarterly Report – Three-Phase Centrifuge Control System**

**By**

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**And**

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### **Review**

Los Alamos National Laboratory has been working with Centech Inc. of Casper Wyoming to build an intelligent setup and control system for a three-phase centrifuge that was designed and is operated by Centech. Los Alamos is designing and building a setup and control system that will make it possible for non-experts to operate the Centech machine. Currently, only Neal Miller, the inventor of the centrifuge, can operate the centrifuge in an optimal manner. With the intelligent control system less experienced operators will also be able to operate the centrifuge in a near optimal mode. Without the control system this "one operator" limitation reduces the potential impact that this centrifuge technology can have on US oil field and refinery environmental problems. The three-phase centrifuge is a portable device that is used for cleaning up oil field and refinery wastes. The centrifuge, in addition to supplying clean up services, recovers pipeline grade oil from the wastes. It therefore has the potential to help somewhat with the US energy supply problems also.

### **Accomplishments —second quarter-- FY02.**

This is the eleventh quarter of the project.

This quarter we were not in the field with Centech at all. Centech has not been in the field since about Thanksgiving of 2001. Their last job was in Cut Bank Montana, where they were working for CENEX. Centech is currently preparing for more work with CENEX starting in mid-April at their Billings Montana refinery. Centech expects from one to two months worth of work (about 14,500 barrels) at the CENEX refinery. Following the CENEX job Centech is scheduled to go back to Evanston WY at the Painter Reservoir unit. This project should last about a month and it will be working again with the high paraffin drip gas from that natural gas field. Following the Evanston work, Centech expects to be at the Chevron-Texaco field in La Barge Wyoming. This field contains the more conventional tank bottoms. Since Centech has not been back to the field since about Thanksgiving we haven't been able to test our most recent changes to the control system. This has slowed us down a little bit, but the good side of not being in the field is that we haven't spent much money. We should be able to go at full speed when Centech is back in the field. The three different upcoming jobs should provide us with a wide variety of feedstocks to test our control system on. The feedstocks vary from refinery waste, to very waxy paraffin, to normal tank bottoms.

In Cut Bank all of the equipment worked well, even the heater and the feed BS&W meter both of which were giving us trouble during our last trip to Evanston. We were able to test and modify several aspects of our control system, which had not yet been tested in the field. One tested in particular suggested that we needed to modify our fuzzy soft-sensor again.

The fuzzy soft-sensor has been the most difficult portion of this control system. It has turned out to be much more difficult to build than we had originally anticipated.

We were able to test this soft-sensor in the field at Cut Bank on our last trip. It worked very well except for a case that we hadn't thought of, but which does occur very frequently. This happens when the heater needs more power but the heater is already running at maximum power.

We have come up with an alternate method that looks like it will be more efficient than a system that is based entirely upon fuzzy rules. This is a neural network based on the output generated by our previously developed simulation code. This soft-sensor requires far less computer code and runs much faster. We have developed these new systems since we were in the field at Cut Bank last quarter. Working with this system and combining it with a fuzzy rule based system seems to be the best combination that we have developed yet. Working with this system and modifying it to correspond with simulation results has taken most of our time this quarter. We now need to test this system again in the field. The jobs that Centech has scheduled for the next few months will provide an excellent suite of tests for the soft-sensor as well as the rest of our control systems.



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**Dear John:**

I got a LA UR number for this report earlier than normal, so hopefully it will get to you on time. The report is a little bit sparse this time due to the fact we were not in the field with Neal. I think that next time we will have a good deal to report.

Thanks for helping us with the extension. I am sure that it will pay off.

Regards,

A handwritten signature in cursive script that reads "Jerry Parkinson".

William Jerry Parkinson